Ordering number: EN 912D

Monolithic Linear IC

SANYO No. 912D

LA3220

2-CHANNEL EQUALIZER AMPE WITH ALC

FEATURES

- Dual pre-amp with built-in ALC (pre-amp x 2 + ALC x 2).
- Due to high gain, recording amp can be formed separately. (variable monitor possible)
- ALC and direct motor drive obtained through SEPP output stage.
- Good ALC response balance between channels.
- Good reduced voltage characteristic.
- Excellent channel separation.
- Quick stabilization during power supply input.

MAXIMUM RATINGS/T_a = 25°C

				unit
Maximum power supply voltage	V_{CC} max		14	V
Allowable power consumption	P_d max	$T_a \leqq 40$°C	600	mW
Operating ambient temperature	T_{opg}		−20 ~ +75	°C
Storage ambient temperature	T_{stg}		−40 ~ +125	°C
ALC Tr. allowable current			3.5	mA

RECOMMENDED OPERATING CONDITIONS/T_a = 25°C

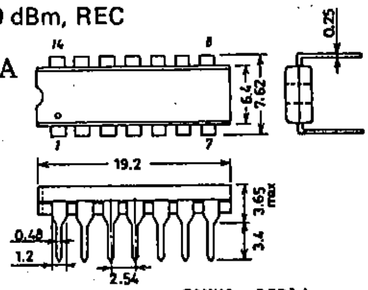
			unit
Recommended power supply voltage	V_{CC}	5 ~ 13	V
Load resistance	R_L	not less than 680Ω	

OPERATING CHARACTERISTICS/T_a = 25°C, V_{CC} = 5 V, f = 1 kHz, R_L = 10 kΩ (PB), R_L = 680Ω (REC)

See specified Test Circuit.

			min	typ	max	unit
Quiescent current	I_{cco}			4.5	10	mA
Open voltage gain	VG_O			85		dB
Voltage gain	VG	PB		40		dB
		REC		58		dB
Maximum output voltage	v_O max	THD = 1%, PB	0.9	1.2		V
Total harmonic distortion	THD	v_O = 0.5 V, PB		0.1	1.0	%
Input resistance	r_i		21	30		kΩ
Channel separation	SEP	R_g = 2.2 kΩ, v_O = 0 dBm, PB	40	50		dB
Noise voltage converted to input	V_{NI}	R_g = 2.2 kΩ, B.P.F. = 20 Hz ~ 20 kHz, PB		1.0	2.0	μV
ALC width		v_i = −60 dBm, REC	35	45		dB
ALC balance		v_i = −20 dBm, REC		0	2.0	dB
ALC distortion		v_i = −20 dBm, REC		0.5	2.0	%

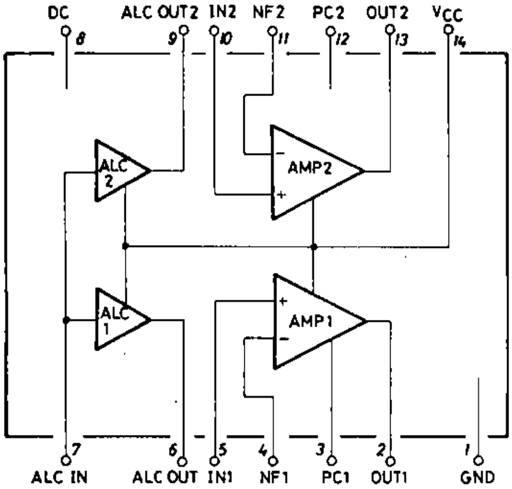
Package Dimensions 3003A
(unit : mm)

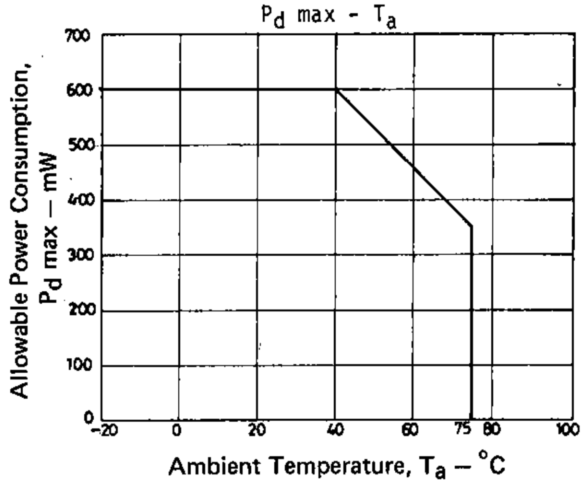


SANYO: DIP14

SANYO Electric Co., Ltd. Semiconductor Business Headquarters
TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110 JAPAN

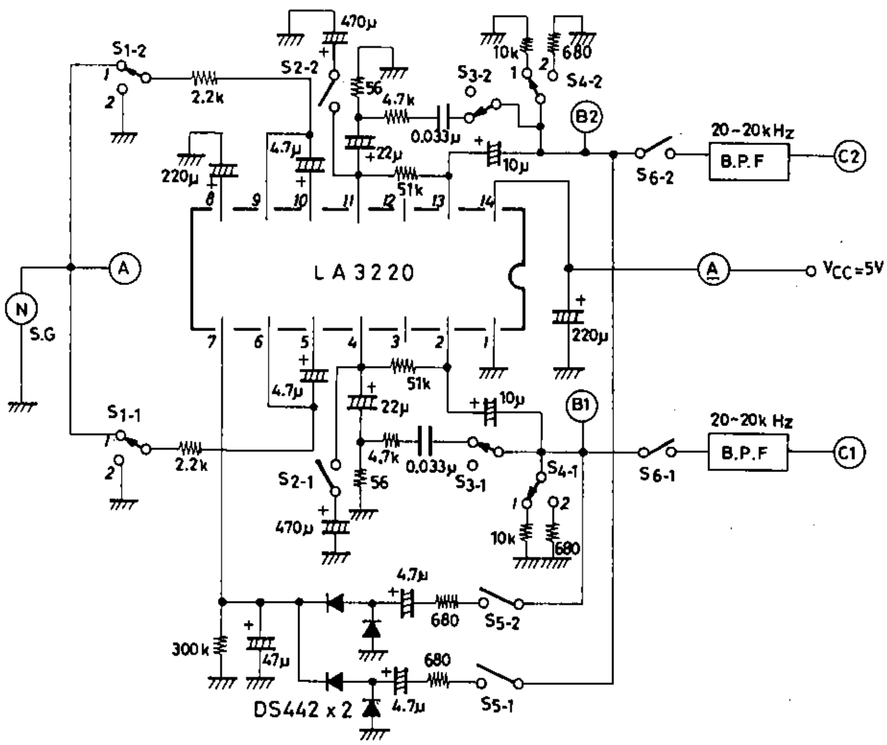
Equivalent Circuit Block Diagram





Test Circuit

Unit (resistance: Ω, capacitance: F)



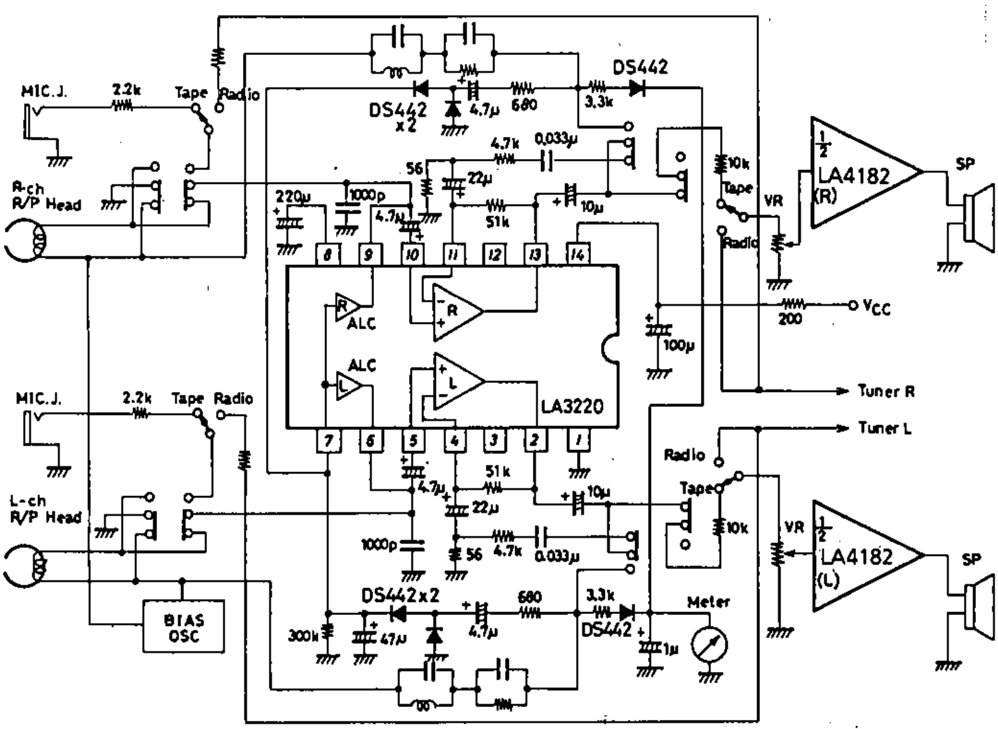
See next page for test procedure.

Test Procedure

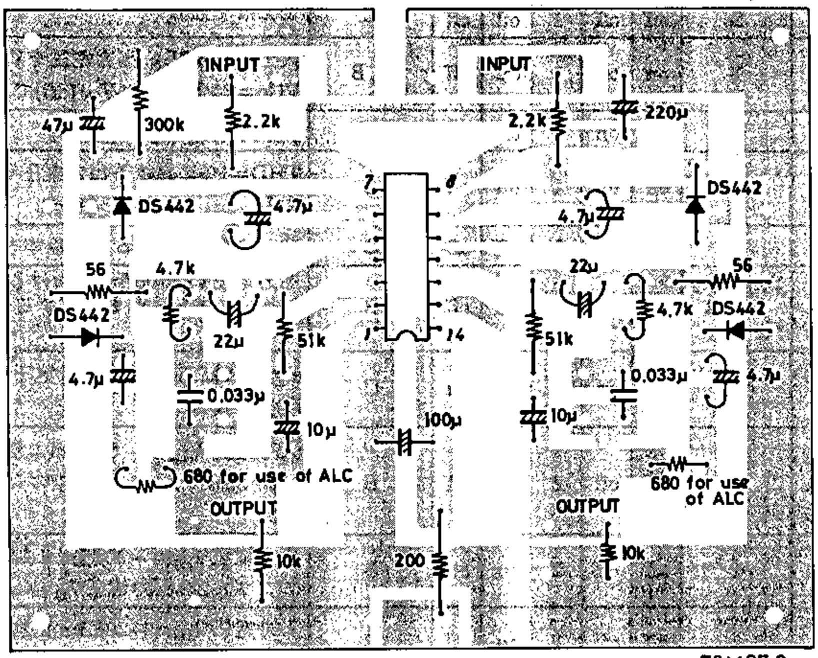
Item	S1	S2	S3	S4	S5	S6	Measurement location	Procedure
I_{CCO}	2	off	off	1	off	off	—	Read ammeter.
VGo	1	on	off	1	off	off	A, B	Measure at VGo = 20 log V_O/V_I (dB) with input voltage at V_I; output voltage at V_O.
VG	1	off	on	1	off	off	A, B	VG = 20 log V_O/V_I (dB)
V_O max	1	off	on	1	off	off	B	Measure output voltage V_O at THD = 1%.
THD	1	off	on	1	off	off	B	Measure distortion factor at V_O = 0.5 V.
CH sep	$S_{1\text{-}1}$ $S_{1\text{-}2}$ 1 2 2 1	off	on	1	off	off	B	Measure crosstalk of amp 1, 2 at output voltage V_O = 0 dBm.
V_{NI}	2	off	on	1	off	on	C	Obtain output noise voltage in 1 kHz gain equivalent when R_g = 2.2 kΩ.
ALC width	1	off	off	2	on	off	B	Input voltage range from when input voltage V_I = –60 dBm until output voltage V_O goes up 3 dB.
ALC balance	1	off	off	2	on	off	B	Output voltage V_O level difference between amp 1, 2 when input voltage V_I = –20 dBm is applied.
ALC distortion	1	off	off	2	on	off	B	Measure distortion factor when input voltage V_I = –20 dBm is applied.

■ Sample Application Circuit: Variable Monitor System

Unit (resistance: Ω, capacitance: F)



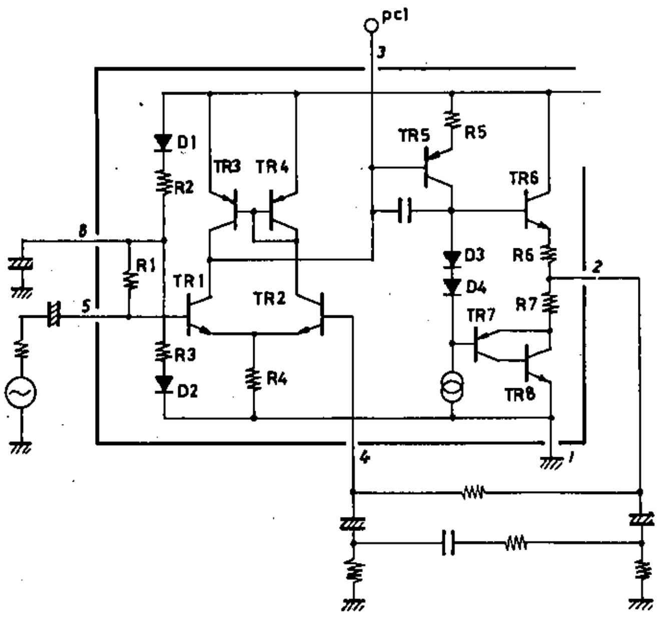
Unit (resistance: Ω, capacitance: F)



70×87.3mm²

Example of Print Pattern (copper foil side)

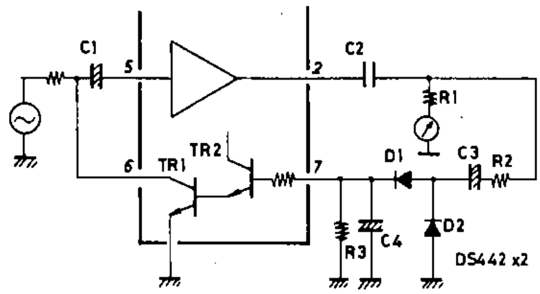
1. Circuit Construction
   1) This is a dual pre-amp composed of AMP x 2, ALC x 2. Input is obtained from NPN differential TR1, TR2; and differential load uses active element TR3 to obtain high voltage gain. The output stage is push-pull system with drive for low load impedance, and can be directly connected to ALC circuit and meter circuit. Also, because the amp open loop gain is sufficiently high, it can be used for recording amp and variable monitor is possible. Input impedance is determined by built-in resistor R1, and is 30 kΩ.



   2) ALC Circuit
   The ALC circuit is composed of TR1, TR2, and due to DC voltage applied to the 7 control terminals, allows variable impedance between TR1 collector and emitter and controls pre-amp input level.
   * Attack Time and Recovery Time
   Attack time is between when input signal is applied until ALC begins to operate. Recover time is betwee-
   justed by R2,C3 time constant. Recovery time is between

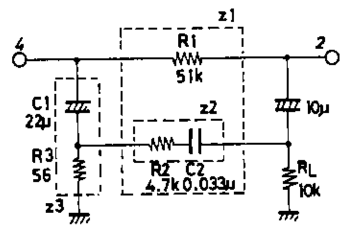
Continued on next page.

Continued from preceding page.
when input signal disappears to when amp level returns to the original level. The recovery time is adjusted by C4, R3 time constant. The rectification circuit, which obtains ALC control voltage, should be a voltage doubler with superior compression ratio. Also, for low voltage 6 V sets, etc., a germanium diode is recommended for D1, D2.

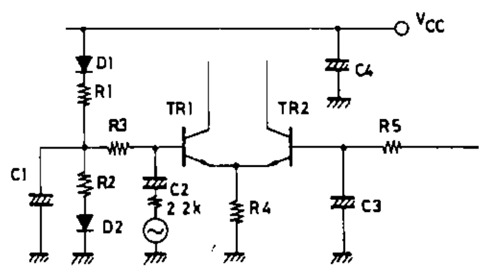


2. Closed loop gain VG (f = 1 kHz)
   Closed loop voltage gain is gotten at (f = 1 kHz) $VG \approx 20 \cdot \log Z1/Z3$
   If $Z1 = 7.2\ k\Omega$
   $Z3 = 56\Omega$
   $VG = 20 \log 7.2 \times 10^3/56$ becomes = 42 dB.
   Therefore, equalizer response is determined by these constants.
   So, playback amp gain is:
   a. 20 log R1/R3 in low frequency regions
   b. 20 log Z2/Z3 in high frequency regions
   Recording amp gain is
   VG = 20 log R1/R3

Unit (resistance: Ω, capacitance: F)



3. External Constants
   External constants are related to the operation starting time of the amp. The operation starting time is designed to be within 0.2 sec, but in this case it is necessary that the differential TR1 and TR2 is the same in time constant. The condition is:
   C1 (R1//R2) = R5 · C3
   Example: If C1 = 220μ, R1//R2 = 5 kΩ, R5 = 51 kΩ
   then C3 is 22μF.

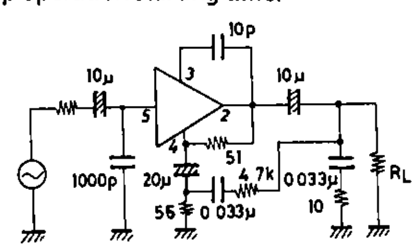


- C1 is a decoupling capacitor, and its capacity changes the ripple rejection rate. (If capacity is large, ripple rejection rate is large.) It is also related to the amp operation starting time, and when R5, C3 time constant is large, C1 must also be made large. The recommended value is 220μF.
- C2 is an input capacitor, and more than 4.7μF is recommended.
- C3 is an NF capacitor, and determines the low region cut-off frequency. If C3 is increased, operation starting time lengthens. 10μF is recommended. The recommended constants therefore are:

R5 (RF)	C1 (CD)	C2 (IN)	C3 (NF)
51 k ~ 100kΩ	220μF	4.7μF	22μF
200 kΩ	330μF	10μF	10μF

We do not recommend more than 200 kΩ for R5 which lengthens amp operation starting time.

4. Notes on Use
   1) Oscillation
      When the amp closed loop gain is lowered, oscillation will occur, so when using it with under 40 dB gain, connect 10pF between pin 3 and pin 2, and 0.033μ (mylar) + 10Ω to the load end. When closed loop gain is below VG = 30 dB, it should not be used.
   2) Radio Interference Prevention
      Connect about 1000pF between input pin (pin 5) and the ground.
   3) Maximum Rating
      V_{CC} max is V_{CC} = 14 V, and it should not go over this. The recommended power supply voltage is 5 V ~ 13 V.

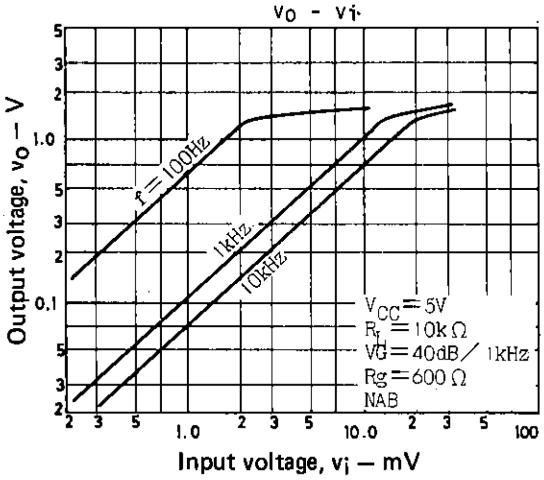


Unit (resistance: Ω, capacitance: F)

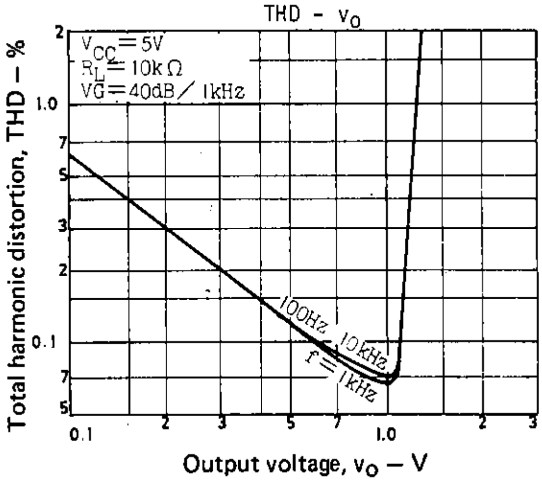
4) Load Impedance
   The total load impedance as seen from the output terminal should not be less than 680Ω.
5) A short between pins will cause breakdown or deterioration.
6) A load short will cause breakdown or deterioration.

Unit (resistance: Ω, capacitance: F)

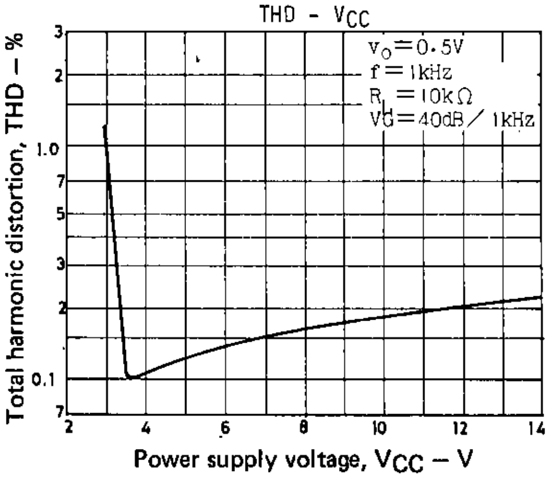
v_O - v_i



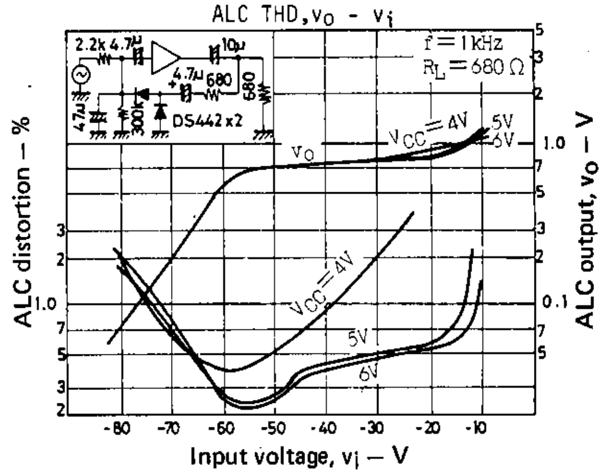
THD - v_O



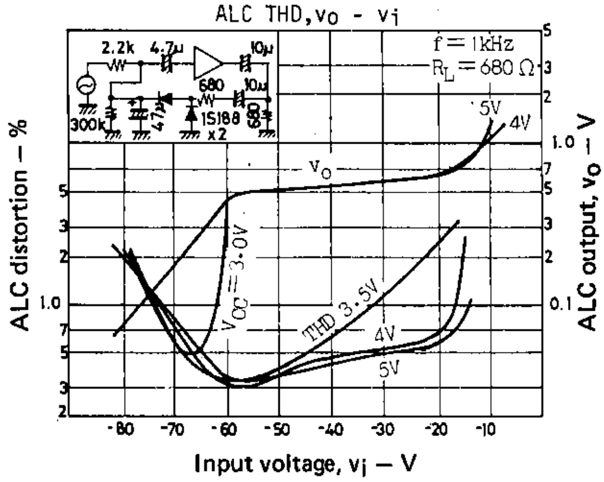
THD - V_{CC}



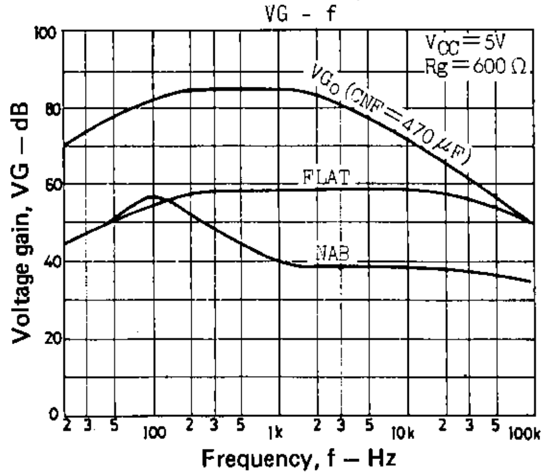
ALC THD, v_O - v_i



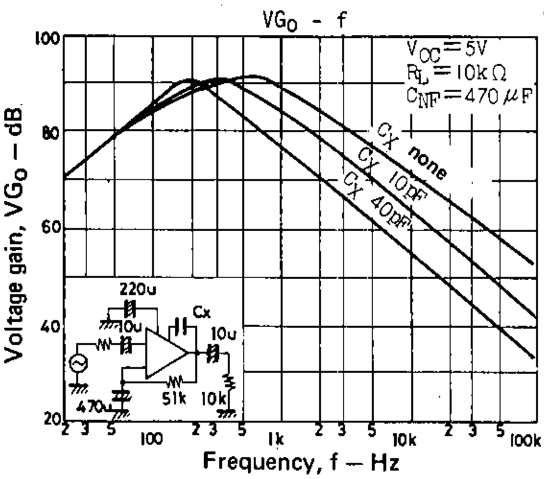
ALC THD, v_O - v_i

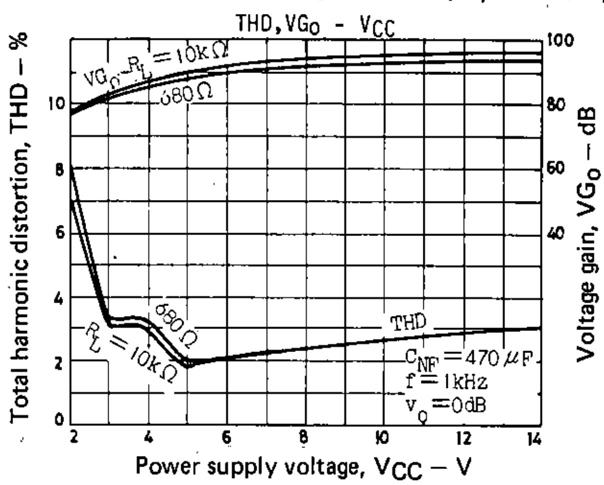


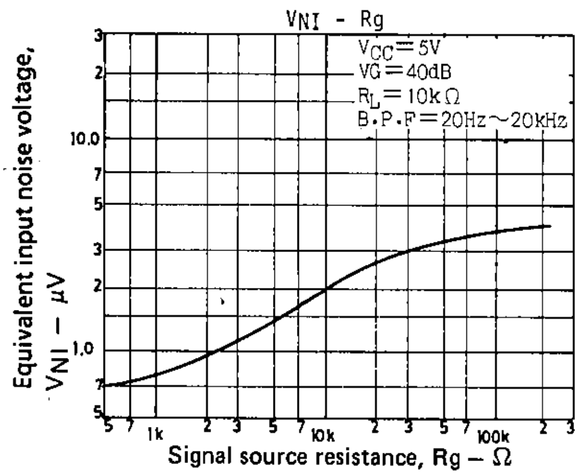
VG - f

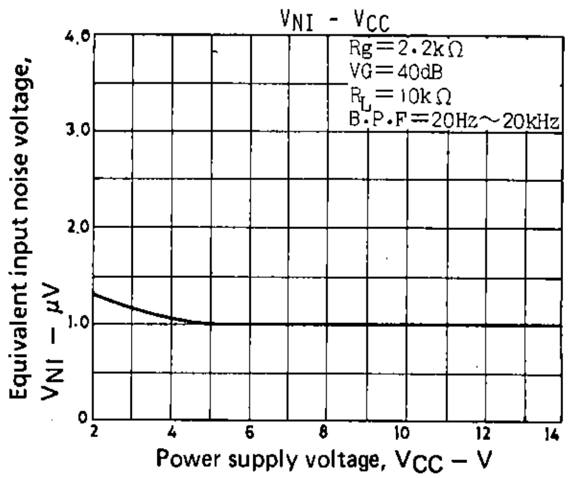


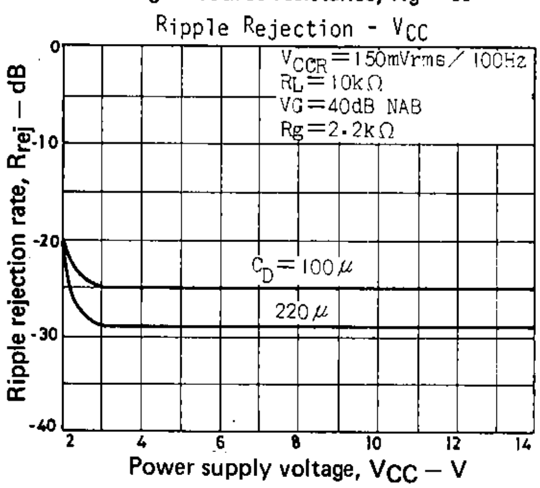
Unit (resistance: Ω, capacitance: F)

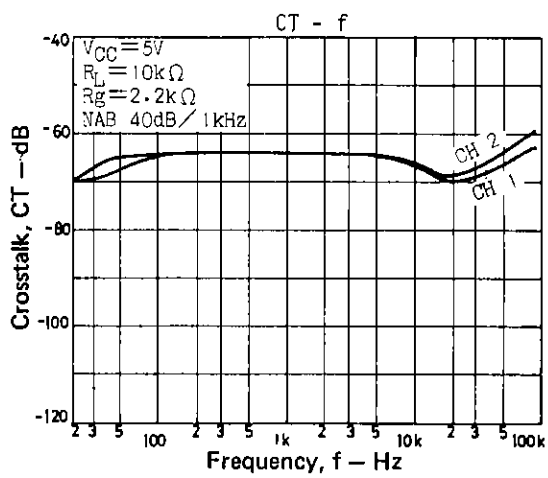


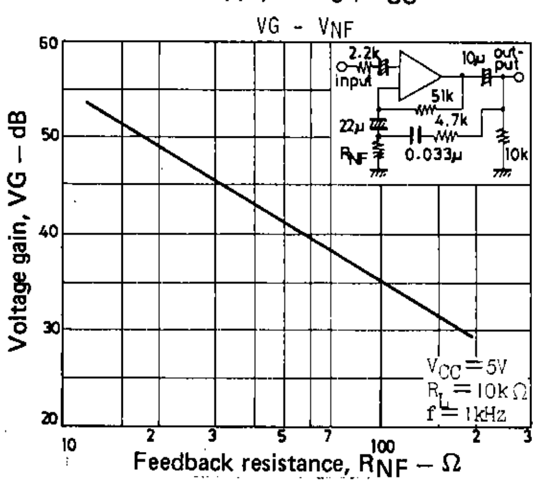


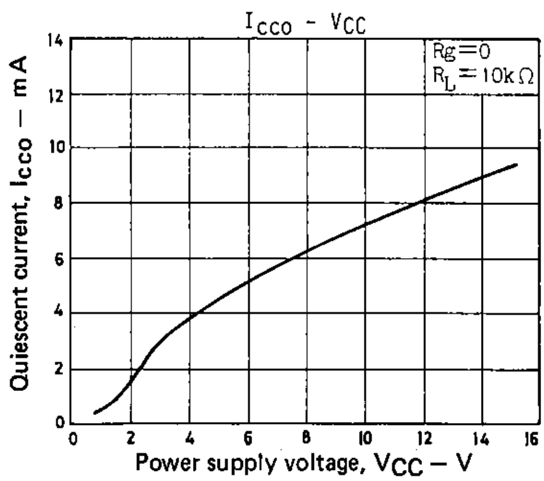


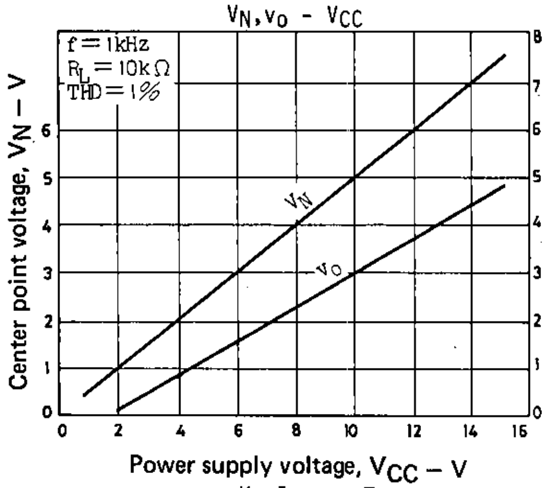


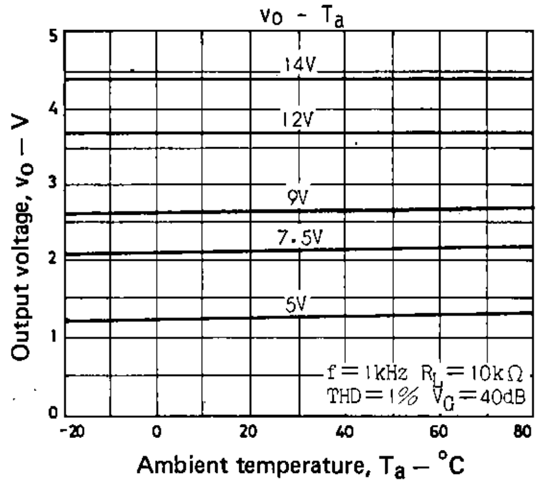


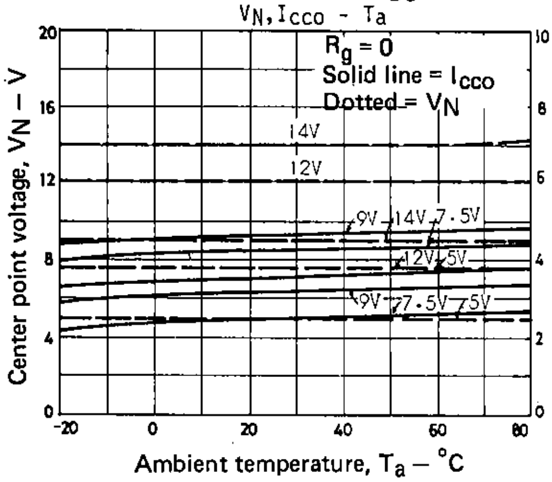


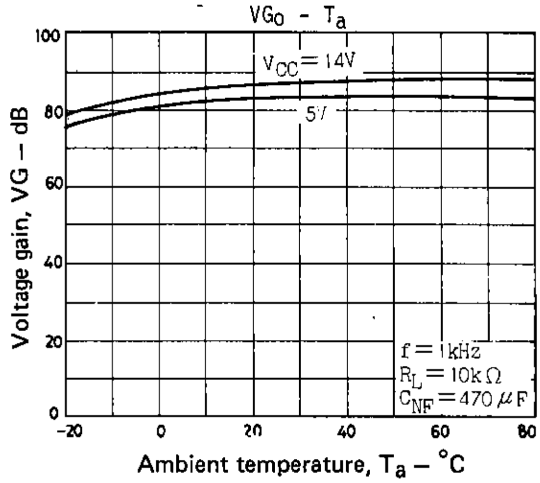





VN,vo - VCC
f = 1kHz
RL = 10kΩ
THD = 1%
VN
vo
Center point voltage, VN – V
Power supply voltage, VCC – V


vo - Ta
14V
12V
9V
7.5V
5V
f = 1kHz RL = 10kΩ
THD = 1% VG = 40dB
Output voltage, vo – V
Ambient temperature, Ta – °C


VN,Icco - Ta
Rg = 0
Solid line = Icco
Dotted = VN
14V
12V
9V 14V 7.5V
12V 5V
9V 7.5V 5V
Center point voltage, VN – V
Ambient temperature, Ta – °C


VGo - Ta
VCC = 14V
5V
f = 1kHz
RL = 10kΩ
CNF = 470μF
Voltage gain, VG – dB
Ambient temperature, Ta – °C